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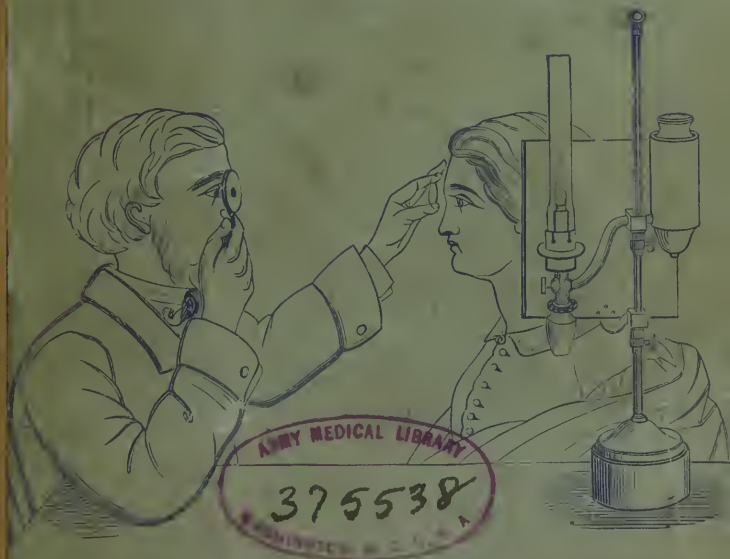
# OUR EYES

AND

HOW TO TAKE CARE OF THEM.

BY

HENRY W. WILLIAMS, M.D.



BOSTON:

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# OUR EYES,

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## HOW TO TAKE CARE OF THEM.

BY

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## PREFACE TO THE SECOND EDITION.

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THE fact that the first edition of this work was some time since exhausted, and that two editions of it have been published in London, (without the knowledge and consent of the author,) permits him to hope that its republication, in a revised form, may be acceptable, to those who wish to know what should be done, and what avoided, in order that the sight, the most important of our senses, may be enjoyed and preserved.

15 ARLINGTON STREET, BOSTON, 1886.

reading, near and far, the ever-present lessons of light and beauty.

Even bone would have been a less perfect protection for the delicate internal parts than is the light tissue which forms the framework of the globe,—so yielding in its elasticity, yet so firm in its tough resistance. In front, we find the strong white membrane, the sclera, modified to a transparent structure, the cornea, an equal safeguard against intruding enemies, and giving unimpeded entrance to light alone.

The nerves and blood-vessels, which, if placed in it, would have weakened the fibrous envelope, are included in another interior membrane, the choroid; and within these is spread out the delicate nervous perceptive tissue, the retina, to which all the other parts are auxiliary and subservient. Upon this images of all visible Nature are pictured: from it the fleeting impressions are telegraphed to the brain, and we are conscious that we *see*.



But, to this function of seeing, other conditions are essential. The eyeball, the most perfect of optical instruments, must have its focal powers completed by the presence of refracting substances, the aqueous and vitreous humors and crystalline lens, which at the same time give form to the globe, and by their quiet pressure keep the nervous tissue expanded, and in readiness for its appropriate work. By a combination of these refracting agents, the rays emanating from objects are transmitted and concentrated so as to render the image upon the retina distinct and well defined.

Furthermore, the passage of rays through these transparent media is regulated by a curtain, the iris; of which the circular opening, the pupil, expands and contracts according to the amount of light; the movements of the curtain being self-impelled, without any effort of the will. Thus, contracting in a strong light, it protects the retina from being injured by the glare; and, expanding

where the light is dim, it allows a larger number of rays to enter, so as to form a clear image. Like the choroid, this curtain is lined with dark coloring-matter, not only to absorb any irregularly refracted rays, and prevent reflections from side to side within the globe, but to exclude the entrance of light through the coats of the eye, except in the direction most suitable for refraction, — through the cornea and pupil.

To complete the noble endowment of capacities, the eye has yet another power. It is a self-regulating optical instrument. We may turn our eyes from the printed page to gaze at a distance, or withdraw them from space to fix them upon a minute atom; and the eye adapts itself instantly to each of these uses. By means of a circle of delicate fibres, so small that till lately their uses were unknown, — the ciliary muscle, — the convexity of the crystalline lens can be altered, and its focal power varied; and thus, without conscious effort, the eye may con-

template the glories of the firmament, or catch the first flitting expression of an infant's love, or explore the mysteries of microscopic existences.

Finally, we have *two* eyes; not merely that we may be doubly provided against the danger of accidental loss of the inestimable privileges of vision, but to enable us to estimate the size, form, and distance of objects with more correctness than we could with one eye alone. To a single eye, every thing would have appeared as a plane surface; and it would have been difficult to determine whether objects had solid or only superficial dimensions, or whether they were near or far. With two eyes, the impressions made on each combine, to convey to the brain perceptions of the properties of things which could otherwise have been gained by the touch alone.

## HOW TO USE THE EYES.

Every normal eye is capable of a great variety and amount of use. It sees near or far with the same ease and with equal clearness. But these powers, extensive as they are, may be overtasked. Because the eyes can see minute objects without difficulty, it does not follow that they should be kept almost constantly looking at small objects. They were intended for varying use; and, like any other organ of the body, they may be enfeebled or injured by having their most delicate powers continually and exclusively employed in one manner.

One of the first rules laid down by a teacher to his pupils should be, *not* to keep their eyes fixed upon their books. Apart from the probable injury to the eye itself by too close application, lessons, especially those requiring thought, cannot be as well committed to memory when the eyes are fixed upon the page as if they are permitted to

wander. The eyes must, of course, look at the book often and long enough to take in the idea; but, if they are too steadily kept there, the perceptive power seems to occupy itself with the visible objects to an extent which is unfavorable to other mental processes. A distinguished engraver once said to me, "I know now how to make a face think;" and he explained that the secret lay in giving a certain expression to the eyes by causing their axes to have a very slight divergence from each other. This corresponds with my observation; and this *position of thought* is exactly the opposite of that assumed by the eyes when looking at a book.

For the sake of even normal eyes, it would be most desirable that education should be simplified; that children should not be required to learn an infinity of details which they are sure to forget, and which could be of no possible use to them if retained; that they should be taught to think as well as to remember, — and, in fact, as a means of

remembering, — instead of giving all their time in school, and often out of school and by artificial light, to acquiring a parrot-like facility of repeating lessons which they do not comprehend. It might require more pains, but it would certainly be a great advantage, if teachers would *teach* children what they know, rather than content themselves with being mere hearers of lessons which may have been learned by the eye, but often not by the understanding.

It would scarcely seem to be necessary to say a word of warning in regard to imprudent testing of the power of the eyes; but instances are not rare where children or adults have done their eyes serious harm by trying to look at the sun, or by observing an eclipse without using a smoked glass. The direct solar light and heat seems, in these cases, to destroy the perceptive power in a greater or less portion of the retina. Injury may also result from using the eyes for looking at small objects by moonlight, which

does not give sufficient illumination for such purposes.

There comes a time when normal eyes find their powers grow limited, and require more light, or assistance from glasses, when looking at small near objects. When this period arrives, it is an error to persist in endeavors to do as formerly with the eyes; but continued use must be avoided, except in a clear light or with the required assistance. It is also a mistake, as will hereafter be shown, to suppose that glasses should not be worn while it is possible to avoid doing so: on the contrary, if worn, they serve to prevent straining of the eyes, and preserve rather than injure vision.

Certain defects of refractive power are due to malformation of the eye, either existing from birth or acquired afterwards, and are not to be removed by remedies or by manipulation. It is a mischievous error to suppose that the form of an elastic globe, filled with fluid or semi-fluid substances, can be

changed, except for the moment, by pressing upon it with the fingers, as has been recommended by charlatans. All the theories, that the eye can have its form favorably modified by rubbing it always in one direction, or by any other manipulation, have no foundation in facts. But while persistent squeezing, according to these methods, can never do any permanent good, it involves great risks. It may lead to congestion and hæmorrhage within the eyes; or give rise to destructive inflammation; or to the formation of cataract or dislocation of the crystalline lens; or may cause almost immediate loss of sight by separation of the retina from its neighboring parts; or may increase the giving way of the back part of the globe, which is already often begun in near-sighted eyes.

The same warnings will apply with equal force against the use of the eye-cups fitted with rubber bulbs, to alter the form of the eyeball, as is asserted, by suction. Valueless



and dangerous as they are, persons are persuaded to purchase and try them,—often-times to their sorrow.

#### VARIATIONS FROM THE NORMAL STANDARD OF SIGHT.

The refractive powers of the eye are modified by three principal deviations from the normal type in the construction of the globe. Sometimes the antero-posterior axis is too long, causing an excess of refraction which brings parallel rays to a focus before they reach the retina. This is myopia, or near-sightedness. In other cases this axis is too short, and the refraction is insufficient to bring parallel rays to a focus at the retina. This is hypermetropia, or over-sightedness. In a third condition, the refracting surfaces have a different focal power in two meridians, so that rays entering the eye in one plane come to a focus sooner than those entering in a plane at right angles to the first. This is astigmatism.

Every eye ought to see distant objects clearly. If it cannot do so, its refractive power is at fault, or it is the subject of disease. The eye ought also to have clear perception of small objects, such as print, etc., when held at a proper distance. If it has not, the fault may lie in either the refractive power or the accommodative function; or there may be disease of some of its parts.

#### NEAR-SIGHTEDNESS.

Myopia, or "near-sight," is by far the most important, as it is also one of the most common, of the refractive defects of the eye.

In near-sighted eyes, the globe is more or less elongated, principally at the expense of its posterior half. Its refractive power is therefore in excess. Parallel rays, such as come from distant objects, are brought to a focus before reaching the retina, and, crossing each other, form circles of dispersion, and only ill-defined retinal images. But this high refractive power enables such eyes

to form, with little effort, very clear images of minute near objects, — to read with less light than is required for distinct vision with normal eyes, — and to dispense with glasses for reading and sewing at and beyond the age when others must assume them (though it is not true, as is commonly believed, that near-sightedness diminishes with age, so far as distant objects are concerned, except to a very slight extent). The impression therefore prevails that near-sighted eyes are stronger than others, and accordingly they are allowed to devote themselves immoderately to the most trying occupations, in which myopic persons seem to take a peculiar pleasure, — reading by twilight or moonlight, doing elaborate needle-work, etc. A very slight myopia may almost be regarded as an advantage, as giving a microscopic perfection to minute vision; but in its high degrees it is a morbid condition, tending to great diminution or even loss of sight. Hyperopic eyes, as I shall show, are liable

to sufficiently annoying disabilities ; but these have their limit ; whereas myopia often involves far graver consequences.

The elongation of the axis of the globe characteristic of myopia occurs mostly in the posterior half of the eyeball. The layer of nerve tissue, the retina, follows the changes in the outer membranes, and, being thus spread over a larger surface, has less definitely perceptive power in a given space than in a normal eye. There is, moreover, a special tendency to morbid changes of structure at and around the spot where the optic nerve enters the eyeball and towards the centre of the retina ; which changes can be perfectly well seen with the ophthalmoscope. Each degree of alteration disposes the parts to still further change, till at length, the portions nearest the axis of vision having become involved, the sight is scarcely sufficient to allow of distant recognition of objects, even with the aid of the strongest glasses. But even here the diseased tenden-

cies are not stayed; but imprudent use of the eyes, or any exertion tending to cause congestion of the vessels within the eyeball, may cause effusions of blood or serum in the deeper seated structures, perhaps separating the retina from its contact with the choroid and suddenly abolishing its powers. Blindness may thus occur in a single day.

Before the still recent invention of the ophthalmoscope, near-sightedness was regarded as an infirmity merely, depriving its subject of many pleasures of vision;—but was by no means looked upon as a lurking enemy waiting to accomplish a swift destruction. Near-sighted persons became, now and then, blind at middle age, it is true; but the loss of sight was ascribed to amaurosis or paralysis of the optic nerve, and the actual relation of cause and effect was not suspected until the ophthalmoscope enabled us to follow each step of the progressive myopic changes. Even where these more fatal results are not reached, the gradual increase

of malformation of the eye, and of the necessity for bringing small objects closer, makes the act of accommodation requisite for seeing near objects with both eyes more and more difficult.

It is during the years of study, say from ten to twenty years of age, that this disposition to progressive changes is most marked: after this period, the tissues of the eye become firmer and less subject to morbid change. But if, during school-life, considerable alterations have already occurred, their full development is only reached in later years. The disease, for thus we must regard the higher grades of myopia, is insidious in its approaches and in its advance, and therefore the more dangerous. The short-sighted child, even if unable to see things upon the distant blackboard, can often do any amount of minute work, if permitted to bring his eyes near his book or slate. At home he is fond of books because he can hold these close to his eyes; while, on the other hand,

he does not so much enjoy the ordinary sports, on account of his imperfect vision for what goes on around him.

The parent or the teacher must not therefore expect complaint of difficulty in using the eyes upon near things, and the child is often unconscious that others see distant objects so much more clearly than he does. Later on, the myopic person, accustomed to imperfect perception of every thing which is beyond a short distance from him, is scarcely conscious if his sight grows gradually more and more imperfect, although perhaps aware that he is obliged to bring small objects nearer and nearer in order to see them distinctly. Thus he goes on, almost unwarned of danger, his eyes with eager diligence building the funeral pile of his hopes ; while, except perhaps in the slight increase of the myopia, his eyes, unless examined with the ophthalmoscope, exhibit and feel no symptoms to excite alarm.

Unfortunately, after the myopic alterations

within the eyeball have reached a certain degree, they are not only irremediable by medical skill, but there is often little hope that still further changes can be averted by any care or by treatment. It is therefore of the first importance that these morbid processes should be prevented, or should be arrested at the early stages of their development, by prudent management of the eyes, which is our sole resource. As the eyes are the most important of the instrumentalities by which we can gain knowledge and can make it afterwards available, their safety demands our utmost care.

A predisposition to myopia is often inherited; but this congenital tendency may remain nearly dormant or even be gradually lessened, and thus give rise to little inconvenience and no danger; or, on the other hand, it may be developed, by excessive devotion to studious pursuits, till it becomes a serious infirmity as regards the individual, and is likely to be transmitted, in a heightened degree, to his offspring.



Should a child exhibit even slight near-sightedness, the parent should take early precautions against its increase. His future ought to be made very early a matter of serious consideration, and he should not be allowed to apply himself too steadily, as he will be strongly disposed to do, to occupations requiring close attention, with the head bent forward. The soundness of the eyes, the chief helpers of the cultivated man, may depend upon the thoughtful consideration we give to their infirmities in childhood before these take the dimensions of serious disease.

It should not be forgotten that myopia is largely a result of education. Whilst unknown among savage races, and comparatively rare amongst the peasant classes in Europe, statistics of the examination of the eyes of thousands of school-children in cities have shown that myopia exists in from twenty to forty per cent, the proportion increasing as the child reaches the higher

classes. In the German universities the percentage is even larger; so that the outlook as regards vision in a future advanced civilization invites very serious reflection.

During the years of study, the myopic pupil should not be required, or permitted, to follow the usual routine. As far as possible he should be excused from learning minute details, which in some studies at least have little real importance. Useless map or other drawing, requiring exactness, should be interdicted, and the child should be spared search upon the map for unimportant places. Written exercises, except in composition, should be to a large extent dispensed with. Too close continuous attention should not be given to lexicon work or to mathematics.

Perfection in technical minutiae should not be the only consideration regarded in according class rank. The pupil should be encouraged to make his ears as well as his eyes useful aids to his memory. If already

considerably myopic, the student should pursue, for the most part, only such studies as are likely to be of consequence to him; or if desirous of further acquirement, he should study less assiduously than others, with frequent brief interruptions, and should often be content with a knowledge of important general facts and principles without giving too much attention to details. He should, if necessary, extend his studies over a longer period than might otherwise be required. The choice of a future occupation should not be one which would be too exacting for the eyes.

Violent exercise which might cause congestion of the ocular blood-vessels, as well as stooping and lifting, and certain games, should be avoided by those who are highly myopic.

Except when slight, myopia lessens little with age; but it sometimes happens with those who are only a little near-sighted, that while still requiring concave glasses for clear

vision of distant objects, they will, after middle life, also need convex glasses for reading.

There are a few cases of apparent myopia where this does not really exist; as for instance in children or aged persons affected with cataract, or where ulceration of the cornea or other disease has existed. But the true conditions are readily discoverable on examination.

The antero-posterior axis being too long in myopic eyes, parallel rays, such as proceed from distant objects, are brought to a focus at a point so far in front of the retina, that only circles of dispersion and therefore confused images are formed upon it. Such excess of refractive power can only be neutralized by concave glasses, which give such a direction to rays entering the eye as will allow of their being brought to a focus at the retina, the proper point for distinct perception. It is, therefore, irrational and useless to attempt a substitution of other means,

instead of resorting to these glasses ; which, by rendering parallel rays divergent, adapt them for the excessive refraction of the myopic eye.

The use of glasses for distant vision is often objected to by parents and friends, from an idea that the short-sightedness will thus be increased, or in the expectation that the eyes will become of normal power at a later period if glasses are not worn. Both of these opinions are erroneous. Myopic eyes are not injured by wearing suitable glasses ; nor will the myopia be lessened by refusing their aid. It is best, therefore, not to deprive young people of the many pleasures arising from distinct vision of things around them, in the illusive hope that the great sacrifice thus made will be compensated by any benefit.

Such glasses should be selected as make distant objects clear without lessening their size and giving them an unnatural brilliancy. They should be too weak rather than too strong. If no glass gives this clearness, the

acuteness of perception may have already become impaired by disease, or there may be a complication of the myopia with astigmatism. Many myopes use the same glasses for reading or music which they wear for distant vision. It is best, however, when the myopia is but slight, to dispense with these in reading, sewing, etc.; or, often, in the higher degrees of myopia, to wear a lower number of glasses, such as will allow of distinct sight at the distance where the book or music would ordinarily be placed.

#### HYPEROPIA, OR OVER-SIGHT.

The condition termed hypermetropia or hyperopia is the opposite of short-sightedness, and consists in abnormal flatness of the eyeball from before backwards, with, in some cases, a positive smallness of the globe in all its dimensions. This malformation, if considerable, may be seen at the outer extremity of the orbit by separating the lids while the eye is turned towards the nose;

the eyeball having somewhat the shape of a turnip.

The antero-posterior axis of such eyes being too short, their refractive power is not sufficient without the aid of the accommodation to bring parallel rays to a focus upon the retina; but is adapted for convergent rays only, which do not exist in nature. It is therefore evident that convex glasses, which, by rendering parallel rays convergent, compensate for this deficient refractive power, must be the only effectual means of rendering near objects distinct; the rays from which are divergent. This condition is not to be confounded with old-sight, where the refractive power is perfect, and distant vision good, but where the accommodative power is imperfect.

Where the hyperopia is of moderate degree, the exercise of the accommodative function in aid of the refraction is sufficient to give clear vision of distant objects, and even for reading during childhood and youth.

But as the accommodative power begins to diminish at an early age, glasses will be required for reading sooner than they are needed by normal eyes; and, in the mean time, such hyperopic eyes should be carefully used, and never employed for a long time continuously upon small objects, especially in a feeble or artificial light. When the hyperopia is of greater amount, almost any continuous use of the eyes is painful because of the strain on the accommodation, and convex glasses are indispensable.

This imperfection of the eye is often undetected for a considerable time, during which a child thus affected experiences great annoyance, and gets very little sympathy. The child is able, as a general rule, to see at a distance; and perhaps, by using nearly all his accommodative power, obtains clear images of large objects. But if, on a dark day, or when he is fatigued, or when confused by the presence of strangers, he is asked to read a fine or blurred print, the accommodation is



soon exhausted, his sight becomes confused, and he ceases to distinguish the words. He stammers and hesitates. His parent or teacher, knowing that he has read the same lesson well enough at other times, thinks him careless or wilful. The child is himself at a loss to understand why he cannot read or learn his lessons ; but the more diligently he endeavors to apply himself to his books, the less able he is to do so, and he is perhaps reproached if not punished for his negligence, until his friends at last become aware of his inability, and give him tardy credit for good intentions.

It is, perhaps, noticed that such a child sees well with his grandmamma's spectacles, but this discovery is often only received with an outcry of astonishment ; the glasses are snatched off ; and he is denied their assistance, the only means which can be of real use to him.

Instances are now and then met with where glasses are even more necessary at six

or eight years of age than they are to the majority of healthy eyes at sixty years. But this extreme hyperopia is less frequent than moderate degrees of this imperfection occurring in youths and young adults. These have been able to use their eyes during childhood with little difficulty, by making constant use of their accommodative power; but, as this begins to lessen from the age of ten years, they at length observe symptoms of what is termed asthenopia, or weak sight, and feel pain in the eyes, or above the brows, after long-continued use.

Slightly hyperopic pupils need to be allowed to rest their eyes frequently, and not fix them on their books. They should have ample light in the schoolroom. It should be understood that the state of their eyes is practically like that of old people, who can do little in the evening without their glasses. If the hyperopia is considerable, glasses should be worn, at least for fine work.

As is well known, convex glasses have the

property of bringing parallel rays to a focus at a distance from the glass corresponding to the degree of curvature of its surfaces. Thus they assist the hyperopic eye by rendering rays so far convergent before they enter it, that, even with its deficient refractive power, the eye is able to form a distinct image on the retina without any further exercise of its accommodative faculty than is required in a normal eye. It is evident that such glasses are the only rational and efficient means of relief for hyperopia. They may sometimes be worn both for distant and near vision, enabling the eyes to refract parallel rays sufficiently while keeping the accommodative power in reserve, as in the normal eye, for the concentration of the divergent rays which proceed from small near objects.

The glasses should be such as afford the clearest and most comfortable vision: but it is often necessary to wear at first a weaker number than is subsequently needed, or than will entirely neutralize the hyperopia; be-

cause the eyes have been so long accustomed to exert their accommodative power for all purposes, that it is difficult at once to relax this effort when looking at distant things, although the glasses supersede the necessity for it.

It is needless to say that too many of our books, printed with worn type, upon thin paper, unfit as they are even for normal eyes, are especially to be deprecated in cases like these just described. Printers and school committees, who from motives of false economy encourage their use, commit a grave error.

#### SQUINTING AS A CONSEQUENCE OF HYPEROPIA.

It was first shown by Professor Donders of Utrecht, that nearly all the cases of squinting towards the nose, "cross-eyes" as they are sometimes termed, are accompanied by and result from hyperopia. This convergent strabismus, or squint, is caused by excessive

use of the muscles which turn the eyes inwards, in the endeavor, by increase of the accommodative effort, to obtain distinct vision.

It is very important that this defect should be remedied in early childhood, either by the aid of glasses or by an operation, as, if allowed to continue, vision frequently becomes so much impaired in the eye which is most deviated, that it is not regained after an operation performed at a later period. When occurring at an age where glasses can be intelligently used to correct the hyperopia, the strabismus may sometimes be relieved by this means. Glasses are often required, after an operation, to increase and maintain its good results; but, in matters so important, competent advice should be obtained, without heeding the counsel of friends who advise delay.

#### ASTIGMATISM.

Astigmatism usually depends on a difference of curvature in two meridians of the

cornea; so that rays passing through one meridian are brought to a focus sooner than those passing through a plane at right angles to the first.

Persons having this defect of refraction see certain lines more clearly than others: vertical lines, for instance, will appear well defined, while those which are horizontal are indistinct, or *vice versâ*. In many cases, however, their attention has not been directed to these phenomena; but they are only conscious that they see with difficulty and pain if the eyes are much used. In some instances, they have tried convex or concave glasses with little benefit. Frequently so much irritation and congestion of the eyes has been induced, that these symptoms are at first supposed to constitute the disease, the primary affection being overlooked.

Astigmatism may be present in an eye otherwise normal, or may co-exist with hyperopia or myopia. Its degree, or its meridi-

ans of greatest variation, may be different in the two eyes; which should, therefore, be separately tested. It can only be relieved by glasses ground upon cylindrical instead of spherical surfaces. The glasses must be accurately fitted, and their frames carefully adapted to the eyes, as any deviation of the axis of the cylindrical glass from its proper direction with regard to the faulty meridian of the cornea lessens, or even nullifies, its corrective power.

Immense relief is often found in wearing these glasses; and unbounded gratification is sometimes expressed by those who, after many fruitless endeavors, see by their aid for the first time with real distinctness.

The selection of cylindrical glasses is, however, often a question involving nice adaptation to complicated conditions of refraction; and, in the mixed and compound forms of astigmatism, it is sometimes necessary to have glasses ground of different curvatures upon their two surfaces, to suit each case.

## ACCOMMODATION OF THE EYE.

Thus far we have considered the eye as an organ possessing refractive powers only ; but it has other capabilities as an optical instrument in its admirable power of self-regulation, by which it is able to adapt itself automatically for seeing distant or near objects. This is termed the faculty of accommodation.

In looking at distant objects, the normal eye is in a state of rest ; and the parallel rays which enter it from such objects are brought to a focus, so as to form a distinct image upon the retina, by the refractive power alone, without calling into play the accommodative function.

Rays proceeding from near objects are no longer parallel, but diverge from each other, and require an increased focal power for their concentration to form a clear retinal image. This increased power is supplied by accommodation.



Accommodation of the eyes for vision of near objects is obtained by two distinct but intimately associated muscular efforts. The eyeballs are turned towards each other by the internal recti-muscles, so that the diverging rays may enter each eye in the direction of its axis, and not obliquely to it; and at the same time the ciliary muscle, within the eye, acts upon the crystalline lens, augmenting its refractive power, and thus giving to the divergent rays the same direction towards the retina as if they had entered the eye as parallel rays.

The accommodative power may be weakened or lost from various causes, which may exist within the eye itself, or in the nerves supplying it. Relief is sometimes to be obtained by optical means; in other cases by treatment directed to the removal of the exciting cause.

The accommodative power gradually diminishes, in normal eyes, from about the age of ten years, because of the lessening plasti-

city of the crystalline lens; but usually in such eyes it continues sufficient for almost all visual purposes until middle life.

#### OLD-SIGHT.

To many persons, the discovery that they do not see as well as they once did is the first intimation of receding youth. Infirmities, wrinkles, they may have none; but they suddenly become aware that they sometimes cannot thread a needle or read fine print without fatiguing effort.

At first, such a person finds that he can still read any print by placing the book farther from his eyes, thus rendering the rays less divergent, or by holding it near a light, so as to obtain a better illumination of the page and thus increase the number of luminous rays which enter the eye. At length, however, he finds that neither holding the book at arm's length, nor nearer the light, will give him his accustomed vision, especially in the evening or on a cloudy

afternoon. Fine print appears blurred ; and, if read at all, it is slowly and with difficulty. If he writes in the evening, he perceives the next day that he has written larger than his ordinary hand.

Meanwhile, perception of distant objects is as clear as ever ; and many an individual, puzzled to account for the loss of his former minute vision, struggles in vain to continue some of his favorite pursuits and to read his evening newspaper comfortably, until, perhaps, he tries on a convex glass, and his rejoicing eyes at once regain all their faculties.

One of the parts principally concerned in accommodation, the crystalline lens, gradually increases in hardness ; and, in most eyes of previously normal accommodation, this hardness attains such a degree at about forty-five years of age, that the change of form in the lens which is requisite for the concentration of divergent rays can no longer be effected ; or, if this can be done for

a short time, the eye soon becomes conscious of a fatiguing effort and is forced to abandon it. This state of things is presbyopia, or old-sight.

It is evident from this explanation of the changes in the lens, that a suitable convex glass, which lessens the divergence of the rays from near objects, before they enter the eye, and thus calls for less effort of accommodation, must be the sole means of relief.

The advice often given to those who begin to experience symptoms of presbyopia, to put off the use of glasses as long as possible, is injudicious; and the assertion, that persons who decline to use glasses for a certain time will be able always thereafter to dispense with them, is wholly erroneous so far as regards normal eyes. It is generally made by those who are themselves short-sighted, and for that reason are able to see small objects without glasses at and after the age when others require their assistance.

But the use of convex glasses may be post-

poned for a while, without injury to the eyes, in deference to the reasonable wish of a lady to appear young as long as possible; or from any motives of convenience or preference;—provided the eyes are used but sparingly for small objects, especially when the light is dim.

Such glasses should be chosen as render objects clear without much enlarging them. At first, they may be needed only in the evening or on a cloudy day; but, as each year lessens the accommodative ability of the eye, it follows that glasses will be more and more constantly required. After a time, their focus must be increased, because of the renewal of the original symptoms; the lens having undergone yet further hardening, and become less capable of accommodative change.

#### LOSS OF ACCOMMODATION AFTER ILLNESS.

After certain diseases, among which diphtheria, measles, and scarlatina may be espe-

cially mentioned, the accommodative power is often partially or almost wholly lost. In diphtheria, this loss of power in the nerves supplying the ciliary muscle is often associated with partial and temporary paralysis of some other nerves, particularly those of the throat. For the time being, the person is more or less unable to see small objects, to continue reading, etc. But, although the recovery of these delicate nervous functions is often gradual, they may be restored as the system gains strength. Meanwhile every care should be taken to avoid prostration of the nervous system; and the eyes must be sparingly used until they regain the ability to work without fatiguing effort.

#### INSUFFICIENCY OF THE INTERNAL RECTI MUSCLES.

In accommodation for near objects, besides the change of form in the lens, we have also a convergence or turning of the eyes towards each other. This is effected by the action of

the internal recti muscles. Rays from an object thus enter the two eyes in such a direction as to fall upon corresponding portions of the retinae, and form there images which harmonize with each other. If these converging muscles act too feebly, although the accommodation may be good as regards either eye when used alone, the other eye being covered, there will be a want of harmony in the images formed in the two eyes when used together, so that a confused impression will be conveyed to the brain. The efforts made by the enfeebled muscles to maintain their accustomed action cause a feeling as of strain at the inner side of the eyeball, near the insertion of the muscles, the discomfort often extending to the forehead above the eyes.

Continuous use of the eyes, when insufficiency is present, brings on a sensation of strain similar to that experienced when any other muscle is kept too long upon the stretch; as, for instance, when the arm holds

up a heavy weight. Frequent intervals of rest should therefore be allowed such eyes.

A disposition to turn outwards is often observed in very near-sighted eyes, but is then often associated with serious changes within the eyeball, which claim the first attention.

#### EYE-GLASSES.

The use of glasses becomes a necessity or convenience, at some time in their lives, to a large portion of the people of civilized communities. If short-sighted, they require glasses in youth, as well as in age, for distant vision. If possessing normal eyes, they need assistance, with advancing years, for seeing near objects. The comfort and safety of the eyes often depend on a proper selection of these auxiliaries.

The glasses in most common use have their two surfaces ground of the same curve, convex or concave upon each side. Periscopic glasses, in which the two surfaces are of different curvature, are sometimes worn,

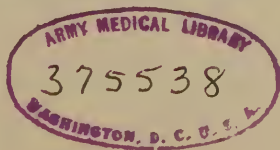


as giving rather more range of vision without turning the head; but their optical qualities are in some respects less perfect than those of the usual form.

To avoid the trouble of changing from one pair of spectacles to another, two different foci are sometimes combined in the same glass, — the lower portion being ground to the focus adapted for reading, and the upper part to that suited for distant vision. The same result is also obtained, less elegantly, by setting two halves of lenses of the two required foci in the same frame.

Cylindrical and prismatic glasses are adapted for certain special conditions of refraction, which are but slightly relieved by the ordinary forms of convex and concave glasses.

Near-sighted persons should select the lowest number of glasses which make vision clear at a distance without rendering objects smaller and unnaturally brilliant. If any difficulty is met with in finding such glasses,



the eye should be examined by some competent authority to determine if any unusual combination of lenses is required, or to ascertain if the difficulty in suiting the eyes arises from the presence of disease.

When convex glasses are required by hyperopic persons for distant vision, they should be of such power as to render every thing distinct. Those used for reading should make print clear at the usual distance, without magnifying much. Persons who need glasses of different foci for near and distant sight should not wear their reading-glasses when looking at a distance; for, if they do so, they will find them less serviceable in reading or sewing, and will soon require a higher power.

The frames of glasses may be round, oval, or of any form, and of various material, according to fashion or preference. As a rule, light materials for frames and large glasses are best. If the nose is so shaped that eye-glasses can be kept in place without having

too strong a spring, these may be worn, if preferred, rather than spectacles. Cataract glasses should generally be mounted as spectacles; for they are worn almost continuously, and their weight makes it difficult to keep them upon the nose if framed as eyeglasses.

Whatever style of mounting is preferred, the frames should be adapted to the form of the bridge of the nose, and to the distance between the eyes; so that, as a rule, the centres of the glasses shall be in front of the pupils. Men generally require frames with longer bridges than women, because of the greater space between their eyes. Silver frames are perhaps the most economical for the poor, since, if bent or broken, they can be repaired.

Tinted glasses, or those having wire-gauze around their border, are often worn as protectors against light and dust. When used to defend sensitive eyes from light, a mild blue is generally more grateful than a neutral

tint; but a neutral or French gray may be worn if more acceptable to the eye. Green glasses are to be avoided, as they do not absorb or neutralize the irritating rays in the spectrum of light as it passes through them. Inflamed eyes often find relief from glasses surrounded by wire-gauze, which exclude wind and dust as well as light; but these should not be worn so closely as to keep the eyes heated.

Very thick plane-glasses, set in spectacle-frames, are sometimes used as a safeguard by stone-cutters, machinists, etc., whose eyes, when unprotected, are often fatally injured by the penetration of particles of metal driven with great force into the interior of the eyeball.

#### THE OPHTHALMOSCOPE.

In looking into an eye, our unaided vision usually penetrates but a little way beyond the pupil; but by means of the ophthalmoscope, invented a few years since by Profess-

or Helmholtz of Heidelberg, we are able to explore the depths of the eye, and detect the smallest variations from a healthy condition.

The room being darkened, the rays from a light placed near the head of the person to be observed are reflected into his eye by the ophthalmoscope as if they came from the eye of the observer; and the latter, looking through the central aperture in the instrument, can examine the illuminated interior of the eyeball, perceiving every detail of healthy structure or morbid change as accurately and clearly as we can see any part of the exterior of the body. All this is done without injury or discomfort to the eye looked at; and the diseases of its internal parts, heretofore hidden mysteries, can be studied, and understood perhaps more perfectly than those of any other organ of the body.

Moreover, the ophthalmoscope affords a means of ascertaining the refractive conditions of the eye; and the presence, and to

an approximate extent the degree, of hypermetropia, myopia, or astigmatism may be determined by its aid.

The benefits derived from the ophthalmoscope are not limited to the better knowledge and earlier discovery of morbid affections of the eye itself. This means of exploration also often enables the physician to detect diseases of distant organs, by the manifestations of their presence exhibited in secondary changes in the deep-seated tissues of the eye, and, by timely discovery, in the optic nerve and retina, of appearances denoting disease of the kidneys, the heart, the brain, or the spinal cord, to take measures to counteract, if possible, the subtle influences threatening life or reason.

DEFECTS OF SIGHT FROM MALFORMATION  
OR FROM CERTAIN STRUCTURAL CHANGES.

In a considerable number of cases where the eyes of children appear healthy upon an ordinary inspection, there is more or less

want of acuteness in the sight, which is little, if at all, relieved by any glasses. Examination with the ophthalmoscope shows, in some cases, changes in the optic nerve of the retina or the choroid; in others, there is commencing cataract; in others, the cornea is slightly hazy from previous ulceration, or it is conical in its form.

A frequent symptom in these cases is a disposition to bring objects quite near the eyes; but even then they are but dimly seen, and not as they would be were the child merely near-sighted, — with great clearness.

Such children should not be required or allowed to apply their eyes closely to small objects; and they should be carefully examined by a skilful professional man to determine the precise condition of the eye and its proper management.

Complete or partial blindness may occur during pregnancy, or while nursing; but this should not cause too much alarm, as, if unaccompanied by permanent morbid

changes, it may be expected to disappear, slowly, after termination of the causes which gave rise to it. But careful inquiry and examination should be made as to the presence of any complicating circumstances; for, if such exist, the recovery of sight may depend upon their removal by suitable treatment.

#### BAD PRINT.

No protest can be too earnest against the manner in which many books, especially school-books, are printed. Surely, if an author's work has any value, it deserves better than to be sent forth in so poor a garb. What is worth printing at all, at least as regards books intended to be constantly used or extensively read, is worth being well printed, with clear type, upon a fair page. Every thing should be done, so far as the arts may serve the interests of learning and science, to make study a pleasure, instead of rendering it an irksome and injurious task.

While eyes are strong they may offer only



feeble remonstrance against the harm they suffer in being forced to decipher that which bad type, ink, and paper have combined to make illegible; yet the day of reckoning comes at last, and many minds, full of useful projects, must abandon their plans, because the eyes, those long-enduring instruments of research, have given way to the continued strain to which they have been needlessly subjected.

#### WOUNDS AND INJURIES OF THE EYE.

The subject of accidental injuries of the eye is one of great importance, as the recovery or loss of sight may often depend on what is done immediately after the accident, before the eye is seen by a physician.

Travellers, especially by railroad, are liable to the lodgement of small particles of dust or cinders inside the lid, or upon the front of the eyeball, causing great suffering. These should be removed as soon as possible, before the eye becomes excessively sensitive, and

before they give rise to inflammation. Sometimes these foreign bodies are to be seen, on close inspection, lodged in the front of the cornea, where they are not felt when the eye is open, though every movement of the lid over them causes much pain. If not firmly embedded, they may be removed by means of a bit of wood, say a toothpick, sharpened to a flat point; but, when forcibly implanted, they are sometimes so firmly held in place, that their extraction requires a skilful hand. When fixed in the centre of the cornea, with the dark pupil as background, they are frequently overlooked at a first inspection. If the foreign body is not found in this situation, it will be discovered, in nine cases out of ten, inside the upper eyelid, and generally at about the centre of the lid, near its border. Thus placed, it scratches the cornea at each motion of the lid or eyeball, and causes great irritation. Such particles, once slightly embedded in the membrane lining the lid, may remain there a long time before being expelled by natural efforts.

If the eyelids are closed for a few minutes, so as to allow the tears to accumulate, and the skin at the centre of the upper lid is then taken hold of with the thumb and finger, and drawn forward so as to lift the lid from the eyeball, the intruding particle is often washed away with the outflow of tears.

If relief is not obtained after two or three trials of this plan, and no physician is at hand, it will be best to ask a travelling-companion to turn the lid, and remove the offending substance; but, if this should be a grain of light-colored dust or sand, good eyes or eye-glasses will be needed to detect it.

The upper eyelid may be easily turned by taking hold of the eyelashes and edge of the lid with the thumb and finger of the left hand, and drawing the lid outwards and upwards; while at the same time a small pencil, a knitting-needle, or some similar thing, held in the right hand, is placed against the centre of the lid, pressing it backwards and downwards towards the eyeball. The person

should look down, as this greatly facilitates the eversion of the lid, which may be easily accomplished if these directions are followed. The cinder or dust may then be wiped off with a handkerchief or the finger.

Smoothly-worn bits of shell from the beach are sometimes inserted as "eye-stones;" the popular idea being, that they pursue the foreign body, and bring it out, *vi et armis*. But these, generally, only add to the sufferer's discomfort; and in the few instances where their introduction is followed, after more or less delay, by the escape of the original intruding substance, they have merely served by their bulk to separate the eyelid from close contact with the globe, and thus allow the sand or cinder to be washed from its position by the abundant tears. Harm is often done by their use, the remedy proving even worse than the disease.

It is so common for machinists and stone-cutters to have atoms of metal driven into the cornea, that, in most shops, some one

of the workmen acquires repute for a certain skill in removing them. But, when the metal is deeply lodged, their efforts often fail; and the cornea is sometimes injured by their attempts, or is so much abraded, that the eye becomes exquisitely sensitive; and, when the sufferer applies for professional aid, it is almost impossible for him, except after the use of cocaine, to keep the eye still enough to allow of the extraction of the metallic fragment.

But workmen are also liable to far graver injuries from bits of metal which penetrate the eyeball instead of lodging upon its surface. In using a hammer and cold-chisel, small bits of steel are often broken from the edge of the tool, and driven with great force into the eye. Having once passed through the tough external coats of the eyeball, there is little to prevent their going on to the very bottom of the eye. These accidents are very deceptive. The workman, perhaps, thinks his eye has only been hit externally by a bit

of metal or stone which he was chipping off; and as he feels at first very little pain, and his vision, it may be, is not much affected, he is unwilling to believe that any thing has entered the globe. But, if examined, conclusive traces are often found of the course of the missile towards the back of the eye; or it may sometimes be seen lodged in the iris or the crystalline lens; or the ophthalmoscope may even detect its presence in the deeper parts of the globe. Usually the man is soon convinced, by the continued irritability of the eye and the increasing failure of his sight, that his is more than an ordinary trivial injury.

Many eyes are lost from penetration of the eye by bits of percussion-caps, which boys amuse themselves in exploding by striking them with a stone or hammer. The sale or use of such dangerous playthings, as well as of toy pistols, should be absolutely forbidden.

In any of these cases, no time should be lost before consulting a skilful oculist, if pos-

sible ; if not, the ablest medical practitioner within reach ; as the chance, not only of retaining any vision in the wounded eye, but of preserving it in the other, may depend on the advice given and the treatment adopted immediately after the injury. The possibility or expediency of the removal of the foreign body should be determined by a man of experience ; as, if allowed to remain in certain parts of the eyeball, it excites, in very many cases, a peculiar form of sympathetic inflammation in the other eye, and destroys the sight.

Grains of powder are frequently driven into the eye by premature explosions, etc. If near the centre of the cornea, and of some size, they should be carefully picked out, as far as may be, soon after the accident, the eye being placed under the influence of cocaine, which renders it insensitive. But small particles may remain, even in the cornea, without doing harm ; and, if they have been some time in the eye, they become in-

corporated in the surrounding tissues, and should not be disturbed unless they cause conspicuous deformity.

Burns, or injuries from acids or other chemical substances, or freezing of the cornea during exposure to intense cold, are usually followed by dangerous ulceration, or even by complete loss of vitality in the cornea. Such cases should never be neglected, and require the most skilful advice.

Clean cuts of the eyeball with sharp instruments or pieces of glass, even when quite large, often result in a good recovery. Lacerated or contused wounds, made by blunt instruments, sticks, horns, and the like, terminate less favorably. In all these cases, the friends of the injured person should avoid curious meddling with the eye "to see how much it is hurt;" and it is well to keep both the eyes closed and quiet, as if asleep, that the wound may be as little disturbed as possible until it can be seen by a physician. No other applications should be



made than a thin, folded rag, wet with cold water ; close, heavy bandages, which might press heavily upon the eye, and every thing like poultices, being especially avoided. No eye-water of any description should be used, except under the direction of the medical adviser.

Penetrating wounds of the eye from scissors, pin-darts, needles, etc., *may be* trivial, if the important internal parts are not involved ; but they are often more serious than appears at first sight. And the fact that a child makes little complaint after such an injury should not put a parent off his guard : for in these cases, as in most lacerated wounds and those produced by blows from blunt objects, we have to fear, not merely loss of vision, but shrinking or deformity of the eyeball ; and, what is far more serious, there is, in many cases, a risk of loss of the other eye from sympathetic inflammation. This last consequence is especially likely to happen if the injured eye continues irritable

and sensitive, or if it becomes so after having been for a time free from active symptoms.

The very frequent occurrence of total loss of sight from sympathetic disease coming on insidiously in the internal parts, and with very little warning, ought to be kept in view in every case of injury of the eyeball, until such time as the danger is pronounced by some competent authority to be past.

#### SYMPATHETIC INFLAMMATION OF THE EYE.

When one eyeball has been seriously injured, or a foreign body remains within it, especially in the ciliary region, a little behind the line of union of the transparent cornea with the sclera; or in some instances of displacement or disorganization of internal parts; the other eye, previously healthy, may become affected with a slow internal inflammation of a most destructive nature.

The early symptoms are often so slight as not to attract notice, unless they have been watched for; and they are at length ob-

served only too late for effective treatment, if they are looked for only in the uninjured eye. The first premonitory signs are to be seen in the eye which has been diseased or hurt; and it should be vigilantly watched as long as any sensitiveness lingers to justify suspicion.

Should warnings in the injured eye be disregarded, the other eye may begin to show a faint blush of redness just beyond the margin of the cornea; the movements of the pupil become sluggish; and it is perhaps found that vision is less good than usual in a feeble light. These changes increase, though varying, and seeming to improve at times; until at last the eye becomes very red, watery, and perhaps painful; the pupil is closed by a deposit of opaque material; and the globe finally shrinks, and is sightless.

More or less serious changes may occur within the eye as the result of concussion, without external wound; as, for instance, from a hit by a cork from a bottle, the end

of a whip-lash, a ball, or any other sudden shock. The anterior chamber, the space between the cornea and the iris, is often at once filled with blood, and vision temporarily lost; but the blood is re-absorbed and sight restored in a few days, if no other harm has been received. The iris may be partially torn or separated at its border, forming a second pupil, but not seriously damaging the visual functions. Sometimes the crystalline lens is dislocated, or the capsule enclosing it is ruptured. This may lead to inflammation, by pressure upon neighboring sensitive parts; or, where no change is immediately apparent, may result in the formation of cataract, the lens gradually becoming cloudy within a few months. The retina may be separated from its connections, and its perceptive faculty destroyed. Deep-seated hemorrhages may also occur. As, in any such injury from concussion, there is a possibility of sympathetic ophthalmia at a subsequent period, all such cases should promptly receive careful attention.

## ARTIFICIAL EYES.

When vision is lost in one eye, and the globe is more or less disfigured or shrunken, a person is often desirous to conceal the deformity, in order not to attract notice, and to restore the natural expression of the features.

An artificial eye may be worn when the eyeball is more or less reduced in size, or when the globe has been removed; but the most favorable condition for its use is where the anterior parts of the eye have been destroyed or removed, leaving a somewhat diminished globe, to which the muscles remain attached. It is important that no extensive adhesions should exist between the eyeball and the lids.

Artificial eyes are in the form of a thin shell, made of a sort of glass termed enamel, and as light as possible, that they may be moved readily by the muscles of the globe in harmony with the movements of the other

eye. They should not be too large, as, in this case, their movements will be limited. The form should be adapted to that of the socket in which they are to be worn, their edge not pressing too much against any part of it. They should appear, when worn, a little smaller, rather than larger, than the other eye, as a staring look is thus avoided. In color and in size of the iris and pupil, they should correspond as nearly as possible with the other eye; but a difference of color is of less importance than to have the eye of a form and size which will be comfortable and movable.

Very slight differences of form or size greatly alter the effect of the eye when inserted. It is, therefore, very difficult to obtain a suitably-fitting eye, except by personal selection from a large number of specimens; and, if once well fitted, a person would do well to order other eyes of the same pattern, otherwise it may not be easy to replace an eye with another as well

adapted, when the first becomes rough or is broken.

. Like other modern substitutes for natural deficiencies, — hair, teeth, wooden legs, etc., — artificial eyes should be laid aside at night. In fact, it is well to take them out occasionally in the day-time, and bathe the orbital cavity, in order to relieve the slight irritation caused by their constant presence, and to preserve the eyes from becoming roughened by constant soaking in the tears and other discharges. But, even with these precautions, the surface of the enamel loses its polish after a while, usually in from one to three years; and the eye should then be exchanged for another. If worn after becoming rough, the secretions from the lining of the cavity of the orbit are greatly increased; and it becomes inflamed, and covered with fungous granulations to such an extent, that the artificial eye can no longer be introduced. But these granulations, however large, must be left to shrink

away under the soothing effect of frequent lotions with water or other mild means. If they are cut off, the cavity is often contracted as healing takes place, and subsequently will not admit the false eye. Of course, in these circumstances, the eye must be laid aside until the recovery of the healthy condition.

Where a good fit, well matched with the other eye, is obtained, artificial eyes are not to be detected by an ordinary observer; and they restore a natural expression to the face, so completely, that even a person's friends forget the counterfeit.

#### CREDULITY AND PRESUMPTION IN REGARD TO THE EYE.

The willingness of the public to patronize pretended oculists, and to recommend certain popular remedies as being infallible for the cure of eye-disease, is a source of pain to every one who witnesses in our hospitals and blind-asylums the lamentable consequences.



Intelligent people would be slow to confide their important business, their farms and merchandise, to the hands of travellers of uncertain reputation, whom they saw for the first time, and never expected to see again: yet they intrust their eyes, worth more than house or lands, to the care of roaming pretenders, whose own assurances are the only warrant of their skill; and who, when their ignorance and failures become too glaringly evident in one place, flee into another. Or, again, a mother thinks it no harm to follow the recommendation of nurse or neighbor, and apply a poultice to the inflamed eyelids of her babe; little dreaming, that often, in so doing, she is dooming it to blindness; and never asking herself how much the presumptuous adviser could know about the matter. An individual who has suffered from some affection of the eye, and found relief in a certain remedy, too often seems to feel himself authorized to advise all the rest of mankind attacked with eye-disease to use the

wonderful specific to which he ascribes his cure. One person spoils the eye of a friend's child by recommending a wash containing sugar of lead; another, equally ignorant where he assumes to be wise, destroys sight by advising, in a case of internal disease, the use of a wholly inappropriate eye-water, because it had suited his own case of external inflammation.

The dictates of good sense would really seem to be forgotten where the eye is in question: surely, if there be any faculty of the body of pre-eminent importance and value, it is the faculty of seeing; and, if there be any organ whose delicate and intricate structure demands the most patient and intelligent study and finished skill for its proper comprehension and successful management, it is the organ of vision. Yet this seems to be a lesson which the community is most unwilling to learn; and multitudes of eyes are sacrificed to ignorance and neglect.

## DISEASES OF THE EYELIDS.

The edges of the lids are often thickened and crusted, and the eyelashes fall out, in consequence of neglected disease of the roots of the lashes, and the lubricating glands which open near them. The healthy condition may be easily restored and preserved by a little care and the seasonable use of proper applications. The crusts should not be allowed to remain upon the edge of the lids, and give rise to ulceration, but should be softened with warm water, and removed without violence.

If left to themselves, the lids grow more and more unsightly, the bulbs which form the eyelashes are at last destroyed, and no new growth is produced; the margin of the lid being left bare and rounded.

After the thickening has continued a long time, the parts are not at once restored to a normal state; and the mild remedies prescribed by the physician must be patiently

continued, and should even be used occasionally after the disease has been subdued, to give a healthy tone to the parts, and prevent any re-appearance of the symptoms.

Rounded tumors are sometimes slowly formed in the lid, at a distance from its margin, which are not to be dispersed by local applications, but require a slight operation for their removal. They should not be allowed to become very large.

Erysipelatous inflammation of the lids causes much swelling and redness; and an abscess sometimes results. Should this occur, it should be opened as soon as possible, otherwise the skin of the lid is extensively undermined by the matter which spreads beneath it. But this should be done with great care, lest the eyeball itself should be injured.

Great swelling of the lids, occurring as a *secondary* consequence of erysipelas, or otherwise, should have immediate attention; as it may be occasioned by the formation of an

abcess deep in the orbit of the eye, which, if not at once relieved by operation, may cause loss of sight or even fatal disease of the brain.

The swelling of the lids which accompanies inflammation of the tear-sac resembles that caused by erysipelas, and is often mistaken for the latter when it is so great as to close the eyes; but it may be distinguished from erysipelatous disease by the greater hardness and tenderness near the nose, over the region of the sac, and also by the less clear definition of the margins of the inflamed surface of the skin.

#### OBSTRUCTIONS OF THE TEAR-PASSAGES.

Great suffering results from want of attention to the early symptoms of obstruction to the proper flow of the discharges from the eye. The lining of the tear-passages is often, at first, merely thickened, and its healthy state may be easily restored; but, if neglected, the lachrymal sac, the reservoir placed in the

side of the nose to receive the secretions from the eye, may acquire a condition of chronic inflammation ; and the passage leading downward from it to the nose becomes more or less completely closed, perhaps requiring tedious and painful treatment for its restoration. When in this condition, a slight exposure may cause inflammation of the sac, with great pain and swelling of the surrounding parts, often mistaken for erysipelas. Matter rapidly forms ; and, if the sac is not promptly relieved, it bursts, and the pus spreads beneath the skin, and at last finds its way to the surface, resulting in a fistula, which is annoying, and difficult to heal.

Formerly, leaden or other styles, or gold or silver tubes, were inserted into the sac and the duct leading thence to the nose, and were worn for a long time ; but this unsightly and often ineffectual means has given place to milder and more successful methods of dilatation. Prevention, however, easily accomplished at first by the use of the mildest

remedies, is better than the cure of these obstructions.

#### STRABISMUS.

Strabismus, or squinting as it is often termed, is a deviation of the eyes from their proper direction in looking at objects. Its most common form, where one or both eyes turn towards the nose, is, as I have already shown, associated with hyperopia in a large proportion of cases. As it usually shows itself about the time when a child begins to look carefully at objects, and is especially likely to occur if the child is enfeebled by illness, its origin is often attributed to an attack of whooping-cough, measles, or other disease.

It is a great mistake to allow this abnormal turning of the eyes to continue unrelieved for years, as is too often the case. Especially is this true where the squint seems to affect one eye only. It is common for parents to wait, first "to see if the eyes will not come right," and afterwards "to let the child de-

cide, when old enough," whether he wishes to have the deformity relieved. This would be a very proper course if it were *merely* a question of appearances.

If the other eye be covered, it will often be found that the child sees less well with the squinting eye: and this loss of acuteness of vision increases and becomes confirmed with time; so that, though an operation done at a later period may remove the deformity, it cannot restore the diminished visual power.

At first, the disposition to turn in is perhaps noticed only when the child is fatigued, excited, or ill; but if this becomes, after a few months, more and more constant, it is best not to defer treatment. This does not, however, necessarily involve an operation; for the disposition to squint may perhaps be controlled by suitable glasses, which take away the necessity for the excessive calling into action of the internal recti muscles. But, if an operation is required, there is no excuse for postponing it, in these days of etheriza-



tion, from a reluctance to subject the child to pain.

When the squint is considerable, it is often necessary to divide the muscle which is affected, in both eyes, in order to insure a perfect result; the deformity and the defective optical conditions being only partially relieved by an operation on one eye only. After operation, it is often essential that convex glasses should be worn, at least for study and fine work, to relieve the hyperopia.

The opposite deviation, where the eye turns outward, is frequently a consequence of near-sightedness, resulting, in many instances, from alteration of the shape of the posterior part of the eyeball, rendering its motions less free in the socket. This acquired condition makes it difficult to remove the deformity by operative means; and the condition of the interior of the eye should be carefully examined to ascertain if progressive and dangerous myopic changes are in progress.

Temporary or permanent strabismus may also occur where the nerves which supply the motor muscles of the eyeball are paralyzed from the action of external causes, or from disease of the brain. The cure in these cases must depend on the removal of the original paralyzing influence.

#### DISEASES OF THE CONJUNCTIVA.

Some of the affections of the conjunctiva, the mucous membrane covering the front of the eyeball and lining the lids, are among the most fatal to vision; and their frequency, and oftentimes their severity, their tendency to linger, and the danger of their being communicated from one individual to another, give them an important place among the diseases of the eye.

#### INFLAMMATION IN NEW-BORN CHILDREN.

Within a few days after birth, the lids of one or both eyes sometimes become red and swollen, and a creamy matter begins to

form. Except where the affection is slight, the symptoms rapidly increase; the lids swell so much as to project beyond the eyebrows, and completely close the eyes; the discharge of matter becomes so copious, that it pours out in great quantity if the lids are separated; and the eyeball itself becomes involved.

If the disease is not checked, the transparent front of the eye, the cornea, is liable to more or less complete destruction from ulceration. This may take place suddenly, from the extreme severity of the inflammation; or it may occur only after the symptoms have already diminished,—the cornea holding out for a time, but at last yielding to the effects of the inflammation of the surrounding parts, and the constant flowing over it of the abundant and irritating discharges.

The liability to ulceration of the cornea renders this disease a source of great anxiety to even those of most experience; yet it is common to see the management of these

cases undertaken by nurses or friends whose little knowledge is worse than ignorance, and who waste precious time in trying worthless means, until it is discovered, too late, that fatal injury has been done to vision.

Cleanliness is of the first importance in these cases, not only for the safe recovery of the eyes affected, but to lessen the danger of contagion. Many an eye has been lost in consequence of being touched with a finger or a towel or handkerchief which had been in contact with matter from the eye of the babe. Applications to the outside of the lids, such as poultices, etc., should be absolutely abstained from, as they are highly dangerous. It is important that the medical adviser should see the disease in its earliest stages; as its fearful progress may often then be cut short, or its severity mitigated and the eyes saved.

INFLAMMATION FROM EXPOSURE TO COLD  
OR DUST.

A most common affection of the external membranes of the eye results from the action of cold or dust, or some similar source of irritation. It may also extend through a family or neighborhood, where the same towels or wash-basins which have been used by an individual having sore eyes are made to serve for other persons.

The pain complained of is a smarting or itching, as if sand or sticks were in the eye; and matter is discharged in greater or less amount, frequently causing adhesion of the lids together during the night.

The disease is often easily relieved at the outset by suitable remedies; but if these are neglected, or if inert or too harsh measures are resorted to, the symptoms are aggravated or indefinitely prolonged, and granulations or ulcers are developed; the disease having little tendency to spontaneous cure. Exam-

ples are constantly seen of the melancholy results of inattention and mismanagement. Working-men are unwilling to lose time in attending to their eyes during the early period of the inflammation; and when, at last, they seek advice because they are unable to work any longer, the changes of structure, slight at the beginning, have become so great, that months instead of days are required for the restoration of the healthy condition. When not absolutely neglected, the eyes are often tampered with, and with ruinous results. The catalogue of substances in popular repute as sure means of relief would be almost endless. Of these, most are worthless, and many injurious.

#### INFLAMMATION FROM CONTAGION.

Rapidly fatal ulceration of the cornea may ensue upon inflammation of the conjunctiva following the introduction of a minute particle of contagious matter from another part of the body; eyes being sometimes thus totally

lost in from twenty-four to forty-eight hours. Immediate and skilful treatment is imperative if the eye is to be saved. Great care should be taken to preserve the other eye, as well as those of any persons who may be exposed, from inoculation with the virulent discharge which flows in abundance from the affected eye.

#### GRANULATIONS OF THE EYELIDS.

After long-continued inflammation, and frequently without this, the inner surface of the upper lid may become rough from the formation of what are termed granulations. Sometimes these are almost cartilaginous in their hardness; and their constant friction upon the cornea a thousand times a day, every time the eye rolls or the lids wink, leads to dangerous alterations of its condition. The cornea loses its smoothness and transparency; blood-vessels are developed where none ought to be visible; and at last ulceration and perforation may take place,

causing more or less implication of internal parts, and injury to vision.

When the front of the eye has become so entirely clouded that the person cannot find his way or do more than perceive light, great patience and confidence are required on the part both of the sufferer and his physician. Speedy removal of the morbid changes is wholly impossible: until the roughness of the eyelids has been greatly lessened, the cloudiness of the cornea can be but little diminished; for, the cause continuing to act, the effect continues. It is hard for a person and his friends to believe that he is improving, when he cannot perceive that he sees much, if at all, better. Yet this may be the case; as it is only when the granulations have been almost removed that the cornea recovers from the effects of their friction, and its clearness is gradually restored. Therefore the sufferer should take courage if his eyelids are made more comfortable and the discharge from them grows less; and treatment



should be hopefully continued till the amelioration of some of the conditions is at last followed by an evident improvement of his sight. No advantage is obtained from frequent changes of remedies in the hope of a more rapid gain.

It is important that the granulations should be *entirely* removed. Those who have been blind for months or years are too often so rejoiced at the recovery of sight and of a comfortable state of the eyes, that they disregard the lingering of some remains of disease beneath their lids which may be roused by slight causes to renewed activity. They are anxious to return to their occupations, and hope their eyes will go on in their course of improvement. It is unsafe, however, to indulge this hope prematurely; and treatment should not be abandoned till all parts of the lining of the lid have been brought to so healthy a state, that the inconveniences and dangers of a relapse are no longer to be feared.

## ULCERATIONS OF THE CORNEA IN CHILDREN

Ulcers of the cornea, most frequently near its centre, are very common in young children. They are attended with intolerance of light, sometimes so extreme, that the child gives up all his usual pleasures, and even his food, to keep the lids day after day spasmodically closed, and the head buried in cushions or pillows. In other cases, the eyes can be opened in the afternoon or evening; though they shrink from the morning light. Children often become restless and peevish; the whole disposition being changed during the continuance of the disease. These cases differ greatly in their duration, and, if neglected, may result in permanent opacities of the cornea, or may be prolonged for months, till the health suffers from want of air and exercise.

It is usually possible, by engaging the child's attention, to obtain a look at the eye in a moderate light, so as to ascertain the

extent of the ulceration, without resorting to forcible opening of the lids.

Even when superficial, these ulcers frequently leave behind them a temporary cloudiness of the cornea; and, if they penetrate deeply, they cause a permanent opacity, which, though it may lessen in extent and density, does not wholly disappear, but affects vision in a greater or less degree. It is, therefore, very desirable that the ulcerative process should be arrested as soon as possible, to shorten the term of suffering, and avert the injury to sight.

Solutions of sugar of lead, a favorite popular remedy, should never be used in the eye; but should be avoided with especial care in all diseases of the eyes in children; since, where ulceration exists, the lead solution is decomposed, and forms an indelible white deposit upon the ulcerated surface. Laxative medicines or blisters, so often used as domestic prescriptions in the hope of clearing the system of "humors," are also objection-

able; the child more often needing tonics and good diet than any debilitating treatment.

Small pimples, of which there may be one or several at or near the edge of the cornea, upon the white of the eye, must not be mistaken for the ulcerations above referred to. They are of comparatively trivial importance, but may result in more serious disease if not removed by mild treatment.

#### INFLAMMATIONS OF INTERNAL PARTS OF THE EYE.

A brief reference to a few points will show how suicidal is the course often pursued in neglecting disease of the important internal structures of the eye until their vitality is wholly destroyed, and recovery of vision hopeless.

Some of the most serious of these changes, requiring prompt and skilful attention, are attended with little pain, and perhaps give warning of their presence only by diminished

sight. When pain does occur, as in the cases of acute inflammation, it differs from the smarting or itching sensations accompanying most of the forms of external inflammation, and has a deep-seated aching character, often extending along the nerves in the neighborhood of the eye, and sometimes more severe in the forehead and temples than in the eye itself. Any such pain, especially if accompanied by dimness of sight, should receive immediate attention as a warning of impending mischief.

As might be supposed, most of the remedies which prove useful in the treatment of inflammations of the external membranes of the eye are not at all adapted to affections of the internal parts, which they cannot reach; and can only be hurtful if injudiciously applied.

#### INFLAMMATION OF THE IRIS.

This curtain, stretched across the interior of the eye, and from which it takes its color,

— blue, hazel, etc., — is frequently the seat of inflammation. Generally this is attended with pain, extending to the brow, or even to the whole of that side of the head, and usually more severe at night. The eye is often quite red, especially around the cornea; but, in some cases, there is at first inspection little to attract attention to the eye. There is usually a copious flow of tears, but not much thick mucous discharge.

The source of danger lies especially in the tendency to closure of the pupil, by adhesion of its edges to neighboring parts. The thickened iris lies in contact with the crystalline lens; and the lymph thrown out from it, similar to the material which unites the edges of ordinary flesh-wounds, forms deposits which cement the margin of the pupil to the lens behind it, and often completely fill the area of the pupil. This misfortune may be avoided by timely treatment, the iris and lens being kept from contact with each other till the inflammation subsides. This is

of great importance to the actual and prospective safety of the eye. If adhesions have already formed, they may sometimes be detached, while still recent, by the use of remedies; but, if neglected, they become firmly fastened, and can only be separated, if at all, by surgical means.

Even slight adhesions increase the danger in case of future attacks of the disease; but, where the pupil has become entirely closed, immediate surgical interference is necessary to prevent a slow, destructive process resulting from pressure of the accumulating fluids behind the iris, which can no longer find their way through the pupil.

Strong light and much use of the eyes should be avoided during the attack.

Persons of rheumatic constitution are liable to repeated visitations of iritis, which may occur at longer or shorter intervals. They should be careful to give prompt attention to the earliest symptoms, — slight pain or dimness, or soreness on moving the eyeball,

—as a prolonged attack may often be averted, or at least a successful result insured, if the eye is at once placed under the influence of suitable remedies.

#### GLAUCOMA.

One of the diseases most absolutely fatal to vision if neglected, or if inefficiently treated, is glaucoma. It is more frequent in women ; usually occurs after the middle period of life ; and often follows physical or mental depression resulting from fatigue in watching with sick friends, or grief in mourning their loss ; or in men, from the anxieties attending business reverses.

The pain in acute attacks is agonizing, and is sometimes accompanied with bilious vomiting : but it is often felt so much more severely in the nerves in the vicinity of the eye than in the globe itself, that these symptoms are frequently mistaken for facial neuralgia ; and, notwithstanding the loss of sight, the primary seat of the disease is overlooked,



or it is thought that the sight will soon return as the pain subsides. The eyeball becomes hard; the cornea loses its sensibility, so that it may be touched with a probe without causing pain; the iris is pushed forward and the pupil dilated by the overcrowding of parts behind it; and all vision, even the perception of light, may be lost within a few days. There is often very little redness of the eyeball. These symptoms now and then subside for a time, to return after a longer or shorter interval with renewed force.

The attack is often preceded by a necessity for rapidly increasing the strength of the glasses worn for reading, and almost invariably by an appearance of rainbow-colors around the light on looking at a lamp in the evening, or of a fog or white sheet thrown over objects in the daytime. These appearances may be continuous, or intermittent and varying in their duration.

On examination with the ophthalmoscope, the entrance of the optic nerve, if this is still

visible, shows a cup-like depression, — a result of the extreme pressure within the globe. As the disease goes on, the transparent internal parts grow cloudy, so that the optic nerve can no longer be seen; the globe becomes of a stony hardness; the pupil is enlarged to the utmost; the iris is thinned by pressure; the lens is crowded forward until it lies against the cornea and takes a sea-green color; and hopeless disorganization ensues in all the tissues. The pain may continue during all these changes, or it may subside at an earlier period.

The only known remedy for this disease is the early performance of iridectomy, before the morbid changes have continued long enough to crush out the visual power, and spoil the eye by their fatal pressure.

The results, in acute cases, of this operation, the greatest triumph of modern ophthalmic surgery, seem almost miraculous. It at the same time removes the extreme tension, and puts an end to the unhealthy action

which gave rise to it ; and a sufferer, one or both of whose eyes had become blind, often obtains instant alleviation of the intense pain, and regains more or less quickly and more or less fully his lost vision. But, to be complete, the relief must be speedy : too long compression of the delicate tissue of the retina destroys its powers. In chronic, or in neglected cases, no operation is serviceable.

#### AMAUROSIS.

Prior to the invention of the ophthalmoscope, the term “amaurosis” was applied to loss of sight arising from sundry obscure conditions of the deeper-seated part of the eye, the exact nature of which was then unknown. Most of these are now distinguished from each other as resulting from various changes, and are designated according to the structures affected ; and, as now understood, amaurosis implies disease in or behind the optic nerve ; excluding such loss of sight as results from inflammation of the choroid or retina,

separation of the retina, changes in the vitreous humor, etc. Many cases, formerly considered as hopeless amaurotic disease, are now found by the ophthalmoscope to belong to a more benign class of affections, capable of relief.

#### DISEASES OF OTHER ORGANS MANIFESTED IN THE EYE.

Not the least among the wonders revealed by the ophthalmoscope, is the detection of diseases of other and distant organs by an examination of the internal parts of the eye. This has become possible; and the appearances indicating certain diseased conditions of the brain and the spinal cord, of the heart and of the kidney, can be as positively distinguished from the structural alterations caused by diseases originating in the eye itself, as any of the most evident external manifestations of disease—as, for instance, those of small-pox and scarlatina—can be discriminated from each other. The knowl-

edge thus obtained will doubtless become more and more available in the explanation of phenomena which have hitherto been obscure, and aid in the successful treatment of disease.

#### CATARACT.

Cataract consists in a loss of transparency in the crystalline lens or its capsule. Cloudiness of the cornea, the result of ulceration, is quite a different thing ; though such opacities are often supposed to be cataract.

When children are born with cataract, or when it is developed early in life, as also in cases where it has resulted from a blow or wound of the eye, the cataract is soft, and of a whitish or bluish-white color. When caused by a hurt, it is formed only in the injured eye ; but, when not the result of an accident, it generally appears sooner or later in both eyes. I have known it to happen, from birth, in several successive generations in one family, and in five and six brothers and sisters in one generation of a family.

Soft cataract may be removed with little risk by an operation; but it is safer, in many instances, to operate by such a method as will require considerable time for the subsequent absorption and disappearance of the opaque lens, rather than to attempt its immediate removal.

But the larger number of cataracts are found in persons beyond middle life; the disease affecting those of every condition and occupation, without apparent relation to the amount or nature of the use they may have made of their eyes. It is probably a result of modifications in the nutrition of the lens, causing it to become opaque, just as the hair becomes white in some persons with advancing age. Like these changes in the hair, it is often hereditary.

The progress of the cloudiness, which gradually shuts out perception of objects, varies greatly in different cases. This circumstance, and the fact that the vision may often be temporarily improved by palliatives,

has allowed charlatans to claim that they have cured cataract without operation; but this pretension, often made, is falsified by the steady increase of the abnormal changes.

Sometimes the existence of cataract is accidentally discovered upon closing one eye, when it is found that vision in the other is nearly gone. In other instances, a slight confusion of vision attracts attention to the eye in the very early stages of cloudiness.

Persons affected with cataract often see better in a dim light, at twilight, or on cloudy days, and perhaps find themselves suddenly unable to see on going into a bright sunlight. They should therefore be careful, when coming out of church or other places into a broad daylight, as also upon staircases, not to make mistakes in their judgment of distances, and thus be liable to falls.

It is an error to suppose that there is no help for old people who become blind from cataract. The operation for its extraction from the eye is generally successful in restor-

ing vision, and, by the use of cocaine, it can be done without pain, and without resorting to etherization, and usually involves only a brief confinement. Persons who are in their usual health, however aged they may be, whose eyes are not otherwise diseased, may therefore submit to this now painless operation with confidence and hope.

#### NATURAL AND ARTIFICIAL LIGHT.

Of all the requisites for a comfortable use of the eyes, none is more important than a favorable and sufficient light; and perhaps none is oftener neglected. Many persons read while lying down; giving more thought to comfort in the position of their bodies than to whether the light falls in such a direction as is adapted for easy vision. Many schoolrooms are so arranged as to favor only the teacher, whose desk is between the windows; while a flood of light falls full on the faces of the pupils, whose eyes have no protection against the strong glare.



Such a position as will allow the light to fall over the shoulder upon the book or paper is best in reading or writing, especially in the evening; the book being so held that the eyes are not exposed to a direct reflection from the pages.

When artificial light is used, it should be steady and abundant. Far more harm is done by too little than by too much light when the eyes are used for reading, sewing, and similar avocations; and we may well rejoice in the advent of better means of illumination than were possessed by our ancestors. Tradition tells us that tallow-candles and pitch-pine splinters enlightened the eager youthful studies of some whom our country has ranked high among her honored names; but we are more fortunate in having for our "midnight oil" the German student's-lamp, the bright gas-jet, the clear flame of kerosene, or the incandescent electrical light.

A soft, steady light, such as is given by a

student's or a carcel lamp, is perhaps the perfection of artificial light; yet we may regard gas or kerosene as good enough for all practical purposes, if used in sufficient quantity, and with burners which do not flicker. Electrical lighting, still in its infancy, gives great promise for the future, in its steadiness, its freedom from heating qualities, and its excellent illumination.

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